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October 9, 1985

MARTIN MARIETTA ENERGY SYSTEMS, INC.

Department of Energy  
Oak Ridge Operations  
Attention: Mr. B. J. Davis, Chief  
Environmental Protection Branch  
Post Office Box E  
Oak Ridge, Tennessee 37831

Gentlemen:

Exposure Information Report - Oak Ridge Gaseous Diffusion Plant

As required by Section 3019 of the 1984 RCRA amendments and modified in the July 15, 1985, Federal Register (p. 28726), enclosed are copies of the Exposure Assessment Report for the K-1407-B and K-1407-C Holding Ponds located at the Oak Ridge Gaseous Diffusion Plant. These reports are being submitted separately; however, the reports will also be included in the Part B applications when they are modified.

If you have questions regarding these changes, please contact me.

Sincerely,



J. G. Rogers, Environmental Coordinator  
Oak Ridge Gaseous Diffusion Plant

JGR:TABowers:shh

Enclosures

cc: W. F. Furth  
W. R. Golliher  
M. E. Mitchell  
T. P. A. Perry  
W. F. Thomas

cc/enc: File - JGR - RC

APPROVAL FOR RELEASE

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Title/Subject EXPOSURE INFORMATION REPORT, K-1407-B

Retention Basin, by IT Corporation

Approval for unrestricted release of this document is authorized by the Oak Ridge K-25 Site Classification and Information Control Office, Martin Marietta Energy Systems, Inc., PO Box 2003, Oak Ridge, TN 37831-7307.

  
K-25 Classification & Information Control Officer

11/15/93  
Date



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# EXPOSURE INFORMATION REPORT

FOR THE RCRA 1984 AMENDMENTS - SECTION 3019

K-1407-B  
RETENTION BASIN

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U.S. Department Of Energy  
K-25 Facility  
Oak Ridge, Tennessee

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Prepared for:  
Martin Marietta Energy Systems, Inc.  
Oak Ridge Gaseous Diffusion Plant  
Post Office Box P  
Oak Ridge, Tennessee 37831

## EXPOSURE INFORMATION REPORT (EIR)

### 1.0 INTRODUCTION

Under the recently enacted Hazardous and Solid Waste Amendments of 1984, Part B permit applications for RCRA hazardous waste landfills and surface impoundments must include an Exposure Information Report (EIR), as required in Section 3019. If the application was submitted after November 8, 1984, the EIR must be submitted to EPA or the authorized state agency by the submittal date for the Part B application.

This EIR contains exposure information relevant to the K-1407-B Retention Basin at the ORGDP (K-25) facility of the U.S. Department of Energy in Oak Ridge, Tennessee. The purpose of the EIR is to define the potential for chemical exposure to human and non-human populations that may result from known or predicted releases of contaminants into the environment.

The following sections will characterize the potential for exposure:

- General Information
- Pathways - Specific Information
- Exposure Potential

### 2.0 GENERAL INFORMATION

This section of the EIR includes:

- Completed RCRA Part B information requirements checklist
- Existing risk assessment reports information
- Surrounding land use and potentially exposed populations
- Waste characterization data
- Compliance records.

#### 2.1 INFORMATION REQUIREMENTS CHECKLIST

Table 1 is a completed information requirements checklist correlating the RCRA permit application sections that contain the required exposure/facility information. Where the information items are not relevant, "N/A" (or not applicable) is marked. Items that are described in this exposure information report are marked "EIR."

## 2.2 EXISTING RISK ASSESSMENT REPORTS

There are no existing risk assessment reports pertaining to the K-1407-B Retention Basin.

## 2.3 SURROUNDING LAND USE AND POTENTIALLY EXPOSED POPULATIONS

The region near the K-25 facility encompasses areas of residential, agricultural, industrial, and recreational uses.

The ORGDP (K-25) facility is surrounded by five counties: Anderson, Knox, Loudon, Morgan, and Roane, which had a combined 1975 population of 437,600. There are two major population centers within 50 miles of the site: the city of Oak Ridge (1970 population - 28,319), which borders the northern side of the facility, and the city of Knoxville (1970 population - 174,587), which is about 25 miles east of the site. Figure 1 shows communities with populations over 1500 that are within 60 miles of the site. Table 2 lists populations around the Oak Ridge National Laboratory, which is approximately 2 miles to the southeast. The area has a low population density primarily because of the federal land. The nearest privately owned land is about 2 miles west and 1 mile north of the K-25 facility.

Agricultural land use has decreased steadily, following a national trend. There are no commercial dairy farms within the 10-mile radius in Morgan, Anderson, or Knox counties; there are four in Roane county and one in Loudon county (DOE 1979). Commercial forest land accounts for more than half of the land area in the surrounding five counties.

Among industrial land users in a 10-mile radius are three DOE plants, which employ about 15,000 people. Three small industrial activities are also located west of the ORGDP (K-25) site in the Clinch River Consolidated Industrial Park.

A limited number of recreational facilities are located within a 10-mile radius. Two commercial camping areas (30- and 100-unit) are 4 and 6 miles southeast of the facility, respectively. A small race track is about 3 miles southeast of the facility. There are no hunting areas in the immediate vicinity of the site nor are there any wildlife preserves or sanctuaries. Deer hunting was started this year.

## 2.4 WASTE CHARACTERIZATION DATA

The K-1407-B settling pond consists of a 1.3-acre impoundment with a storage

volume of approximately 1 million gallons. This impoundment is used primarily for settling the metal hydroxide precipitates generated during the neutralization and precipitation of metal-laden solutions treated in the K-1407-A Neutralization Unit. Presently the K-1407-B treatment process unit receives wastes from the K-1407-A Neutralization Unit, K-1420 Metals, and Decontamination Facility, and the K-1501 Steam Plant. K-1407-B settling pond discharges through an NPDES discharge point.

A discussion of the hazardous wastes that are discharged to the K-1407-B settling pond follows.

K-1407-A -- EP toxic metal laden acids, bases, and rinse waters enter K-1407-A for treatment. Cadmium, chromium, and lead contaminated neutralized effluent and precipitated metal hydroxide sludges are discharged to K-1407-B settling pond.

K-1501 Steam Plant Water Softener -- The K-1501 water softener reagent consists of calcium and magnesium chloride and sulfuric acid solutions. The pH of this stream ranges from 1 to 4.

K-1501 Coal Pile Runoff -- K-1501 coal pile runoff consists of leachate from the coal pile storage areas at the K-1501 Steam Plant. The pH of this stream ranges from 2 to 3.

K-1420 HCl Stripping Bath Effluent -- The K-1420 stripping bath effluent contains 18 to 24% HCl with dissolved nickel chloride, ferrous chloride, cadmium, chromium, and lead. A nitric acid bath effluent will also be part of this waste stream.

K-1420 HCl Cleaning Bath Effluent -- The K-1420 HCl cleaning bath effluent contains 18 to 24% HCl with dissolved ferrous chloride, chromium, and lead.

K-1420 Metals Finishing Rinse Effluent -- The K-1420 plating rinse effluent contains HCl, water, cadmium, and chromium.

Table 3 summarizes pertinent information concerning the hazardous wastes that are stored at the K-1407-B Retention Basin. This table lists the hazardous wastes that are treated at the facility, their associated hazard classification, and the basis for that classification. In some cases the classification is based on applying knowledge of the hazardous characteristics of the waste and

knowledge of the materials or processes used. For listed wastes, the classification is based on the listing.

The ORGDP (K-25) plans to close the K-1407-B Retention Basin by November 8, 1988. K-1407-B currently discharges through an NPDES point. Effluent data are presented in Tables 4 and 5. Sludges from K-1407-B have been sent to K-1407-C, Sludge Retention Basin. Upon completion of K-1407-H Central Neutralization Unit, the NPDES discharge point will be relocated to the discharge of K-1407-H.

The sludge and subsoils beneath the impoundment were sampled in May-June 1985. Appendix C, in the Part B application, contains the analytical results of this sampling program. The results indicate that the sludge is nonhazardous as defined by RCRA Subpart C. Contaminant concentrations in the subsoils were extremely low, and they will be discussed in Section 4.2 of this EIR.

## 2.5 COGNIZANT ENFORCEMENT AUTHORITY AND COMPLIANCE RECORDS

The K-1407-B Retention Pond is subject to compliance inspections by the Tennessee State Department of Health and Environment, under the Rules Governing Hazardous Waste Management in Tennessee. The NPDES discharge is also regulated by the same state department. Inspection and compliance records will be found in the Nashville, Tennessee office.

There have been no known releases of contaminants or major violations associated with K-1407-B.

## 3.0 PATHWAY - SPECIFIC INFORMATION

This section contains information pertaining to site specific transport pathways for contaminants both on and off site. It is designed to supplement information already provided in the Part B application. Pathways include: ground water, surface water, air, contaminated soil, and subsurface gas.

### 3.1 GROUND WATER PATHWAY

Table 6 contains that part of the information requirements checklist pertaining to the ground water pathway.

#### 3.1.1 General Hydrogeologic Information

Information regarding hydrogeologic conditions at the ORGDP (K-25) site is limited and general in scope. No detailed hydrogeologic studies have been made at the site. General hydrogeologic information is contained in Section E.2 of

### 3.2 SURFACE WATER PATHWAY

Table 7 contains the information requirements checklist for the surface water pathway. Figure 1 shows the location of all surface water bodies within the 4-mile radius of the site.

#### 3.2.1 Flood Hazard

The liquid level in the K-1407-B pond is controlled by an outlet weir. A minimum of 2 feet freeboard is maintained at all times; therefore, overtopping and runoff should not occur. The pond is not in the 100-year flood area (see map 6, Appendix B).

#### 3.2.2 Surface Water Use

There are no direct drinking water intakes downstream of the K-25 facility within the 3-mile radius of the site on the Clinch River. K-25 has a drinking water intake on the Clinch River upstream from the confluence with Poplar Creek. The Clinch River is used for navigation and recreational purposes (swimming, boating, and sport fishing).

#### 3.2.3 River Velocities

River flow for Poplar Creek for the lowest three consecutive day flow for 20 years of data (3Q<sub>20</sub>) was 6.4 cubic feet per second. Similar data for the Clinch River upstream of the Gallahar Dam (the nearest gage station) were not available. This information is available for the Melton Hill Lake downstream below the Gallahar Dam.

#### 3.2.4 Surface Water Quality

Surface water quality data have been taken at points in Poplar Creek and in the Clinch River, primarily to provide information on background concentrations. The discharge from K-1407-B is regulated under the NPDES program. Effluent data from this discharge are given in Tables 4 and 5.

#### 3.2.5 Surface Water Releases

Other than the controlled release from the NPDES discharge of K-1407-B, there have not been any known releases from the retention pond.

#### 3.2.6 Food Chain Contamination

There is recreational fishing on the Clinch River, but probably not in Poplar Creek. No commercial fishing takes place within the 3-mile radius.

the Part B application. A ground water survey has been started to characterize the ground water systems under K-25. No results are available at this time.

### 3.1.2 Existing Contamination

There is no known existing contamination in the ground water systems at K-25. Due to the relatively low permeability and primary porosity of the soils, any contaminants, particularly heavy metals, would be retarded in their movement. From analysis of preliminary hydrogeological data it appears that hydrologic gradient is towards Poplar Creek, which serves as a natural hydrologic barrier to ground water flow.

### 3.1.3 Ground Water Uses

Because of the rural setting of the ORGDP (K-25) site and the fact that little industry is close to the site, the primary use for ground water is for domestic purposes. There are a limited number of residential wells, and Figure 1 is a map showing those wells within a three-mile radius of the K-1407-B unit. Most of the area within a 3-mile radius is U.S. government land with restricted access. There are no known drinking wells on K-25 property. The nearest wells are approximately 2 miles west and 1 mile north of the site. These wells are effectively segregated from ground water under the site by the Poplar Creek, which receives water from ground water systems to its north (i.e., residential) and from the south (i.e., K-25 facility).

### 3.1.4 Ground Water Discharge and Recharge Areas

As evidenced in Figure 1, the site area is characterized with well-defined valleys and ridges. The ORGDP (K-25) facility is in a valley surrounded by a pine ridge to the south, McKinney Ridge to the east, Black Oak Ridge to the north, and the Clinch River and Poplar Creek to the west. The entire pervious surface of this valley serves as a recharge area. Water infiltrates into the soil and is most likely discharged into the Poplar Creek or Clinch River.

### 3.1.5 Net Precipitation

The 20-year (1951-1971) average annual rainfall precipitation rate for the Oak Ridge area is 53.5 inches. The mean annual lake evaporation for the Oak Ridge area is taken from the National Weather Service (Linsley, et al., 1975) and is estimated to be 34-36 inches.

The annual net precipitation will range from 17.5 to 19.5 inches.



### 3.3 AIR PATHWAY

Table 8 contains the information requirements checklist for the air pathway. Wind roses (seasonal) for the ORGDP (K-25) area are presented in Figure 1, Section B of the Part B application.

#### 3.3.1 Air Monitoring Data

No air monitoring data have been taken near the K-1407-B retention pond. The only air monitoring data that have been collected were to determine background levels of particulates and fluorides on site.

#### 3.3.2 Population Distribution

Table 2 provides incremental population levels in the vicinity of the Oak Ridge National Laboratory (ORNL). ORNL is approximately 3.5 miles southeast of the K-25 facility. Population by counties is given in Section 2.3.

#### 3.3.3 Air Releases

The K-1407-B Retention Pond is an open impoundment containing inorganic constituents and trace quantities of organic constituents. The organic constituents, especially those with high vapor pressures, may volatilize and enter the air above the surface. However, concentrations of these organics are extremely low (see Table 4), and would not contribute any noticeable difference in airborne concentrations on site. In addition, the dilution effects of advection and dispersion would further reduce concentrations as the organics move downwind towards potential receptors; the closest being 2 miles west and 1 mile north of the facility.

### 3.4 SUBSURFACE GAS PATHWAY

This pathway is not applicable to the K-1407-B Retention Pond.

### 3.5 CONTAMINATED SOIL PATHWAY

Table 9 contains the information requirements checklist for the contaminated soil pathway. Soil samples have been taken below the sludge layer in K-1407-B at 6 inches. Table 10 presents this data, with the "A" representing composite samples taken at a 6-inch depth. Ground water chemical analyses have not been conducted.

### 3.6 TRANSPORTATION INFORMATION

Table 11 contains the information requirements checklist for the transpor-

tation information. No wastes involved with K-1407-B are transported off site. The sludge was removed one time from the pond to K-1407-C in 1973.

### 3.7 MANAGEMENT PRACTICE INFORMATION

Table 12 contains the information requirements checklist for management practice information. Section H contains information on personnel training and emergency response activities. No workers have been injured or become ill as a result of the K-1407-B operation.

## 4.0 EXPOSURE POTENTIAL

### 4.1 INTRODUCTION

This section describes the potential exposure of contaminants in and potentially released by the K-1407-B Retention Pond.

Two potentially exposed populations are identified: residential and occupational. Residential population distribution is described in Section 2.3. The occupational population at the ORGDP (K-25) facility is presently 3200 workers, but this number will decrease when the facility is placed in standby. Less than 10 work within 20 yards of the K-1407-B unit. This subset would constitute the occupational population that is potentially exposed.

Exposure pathways, analogous to transport pathways, are described. They include: ingestion of ground water, ingestion of and contact with surface water, inhalation of air, subsurface gas, contact with contaminated soil, transportation related, and worker/management practice related.

### 4.2 INGESTION OF GROUND WATER

Ingestion of contaminated ground water is not considered to be an important exposure pathway for either the occupational or residential populations. There are no drinking water wells on site, so the occupational population is not exposed. Similarly, local topography and regional geologic information indicate that subsurface flow near K-1407-B discharges into Poplar Creek. Subsurface flow from off site (south of Black Oak Ridge to the north) probably discharges into Poplar Creek also. The only residential wells near the K-1407-B basin are north of this ridge in another watershed. Figure 2 shows the location of these wells. Even if new wells were installed south of Black Oak Ridge, there would be no potential exposure, since Poplar Creek is an effective hydrologic barrier.

Any contaminated flow from the basin would be intercepted by the creek, thus preventing the wells from pumping contaminated water. A ground water monitoring system is scheduled to be installed in the near future. This should better characterize the ground water system under the basin and provide an early warning capability for detection of leaching and subsequent contaminant plumes.

#### 4.3 SURFACE WATER

There are two potential modes of exposure with contaminated surface water: ingestion (drinking) and dermal contact (swimming). A greater potential risk of exposure is via the surface water pathway rather than via the ground water pathway because Poplar Creek hydrologic barrier and potential receptors do exist.

For the occupational population the potential exposure is very low, because Poplar Creek is not used for swimming or drinking purposes. A small segment of the residential population could potentially be exposed. In terms of dermal contact during swimming, the only areas where this may occur would be upstream of the basin on Poplar Creek, or downstream in the Clinch River. In either case, exposure would be negligible, as the upper Poplar Creek cannot receive any contaminants from the basin, and the dilution of flow from the Clinch River would reduce concentrations down to a very low level.

Potential exposure through ingestion of contaminated surface water is also expected to be very low. Poplar Creek is not a source of potable water. The nearest drinking water intake on the Clinch River is beyond the 3-mile radius of the site downstream, so dilution effects of the river should reduce the concentrations of any contaminants released from K-1407-B via contaminated runoff into Poplar Creek. The fact that all the constituents analyzed in the K-1407-B effluent were extremely low and near detection limits further substantiates that contaminants in the surface water would be extremely low.

#### 4.4 AIR

The mode of potential exposure via the air pathway is inhalation of vapors and particulates or fugitive dust. Organic constituents that can volatilize and be diluted on site offer some potential exposure to the population. This potential is very small, however, as concentrations in the supernatant of the basin are very low. Using the organic effluent data for the NPDES discharge as representative of the supernatant, the highest average concentration of an organic constituent was 0.118 mg/liter for acetone. Concentrations this low will be

diluted to negligible levels upon volatilization. Potential exposure to residential populations will be even lower due to the additional dilution effects of advection and dispersion as the vapors are carried downwind.

Potential exposure to fugitive dust emissions is not important because the basin is continually covered with water; there are no areas where the sludge may dry out or areas where material has spilled onto the adjacent land.

#### 4.5 SUBSURFACE GAS

This exposure pathway is not applicable to K-1407-B.

#### 4.6 CONTAMINATED SOILS

The potential for exposure from contaminated soils is extremely low. Exposure in this case would be as a result of dermal contact with contaminated soils. There have been no known spills of contaminants from K-1407-B. In addition, no potential receptors, such as children playing, exist on site.

#### 4.7 TRANSPORTATION-RELATED EXPOSURE

No waste is transported off site from K-1407-B.

There is potential exposure by means of inhalation of volatilizing vapors and dermal contact with the sludge. Workers wear protective clothing, and concentrations of contaminants, including EP TOX ones, are so low that inhalation or contact should be unimportant. Sludge is not handled by workers. This will be an applicable pathway when K-25 starts placing sludge in concrete in a couple of years.

#### 4.8 WORKER-MANAGEMENT PRACTICES

There are no workers who are constantly on site at the K-1407-B pond. The ORGDP (K-25) facility has an occupational industrial hygiene program to address the worker health needs, and emergency training and response for occupational exposure.

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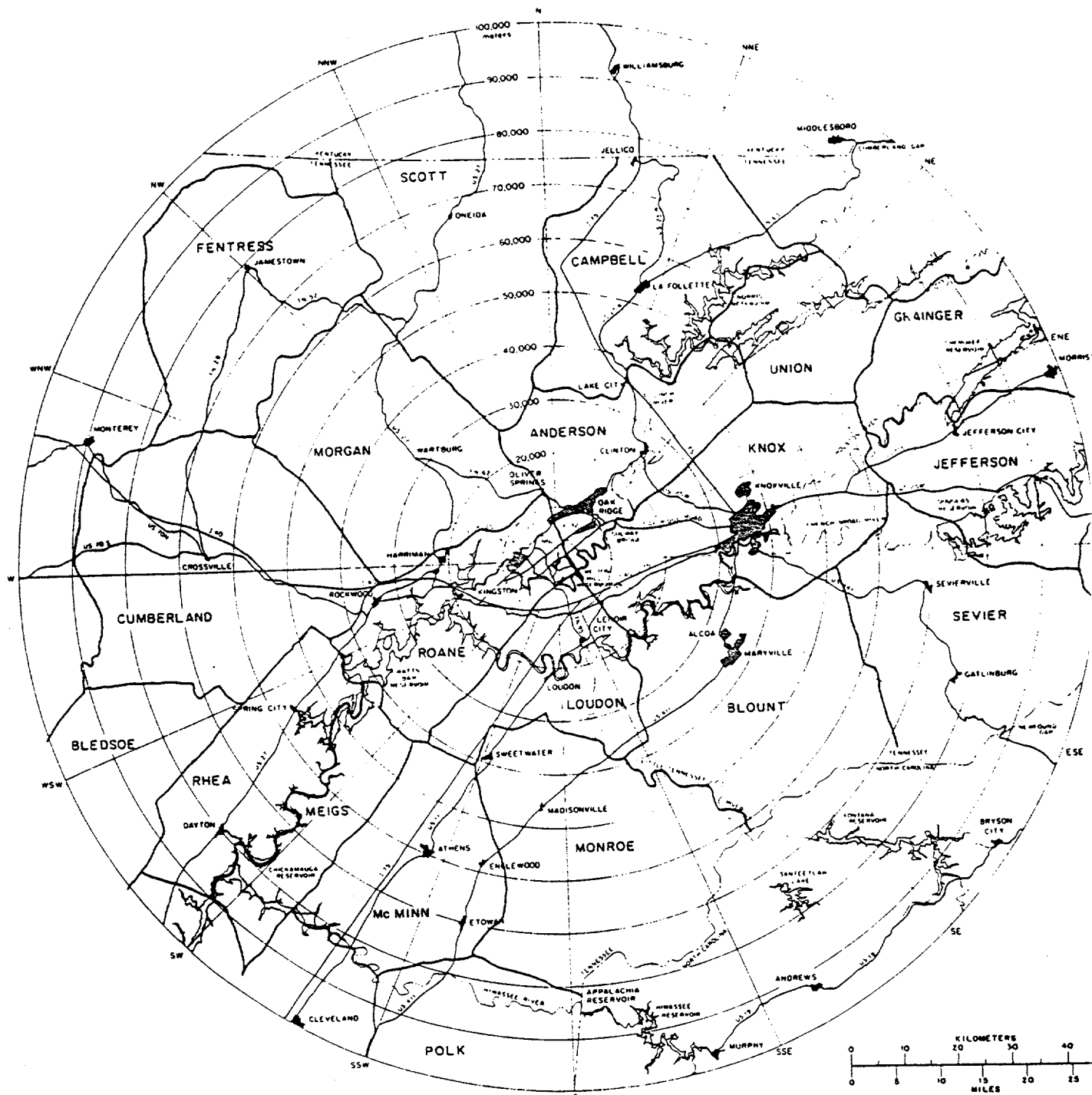


Figure 1. Communities with a population greater than 1500 within a 100-km radius (60 miles) of the Oak Ridge Reservation.

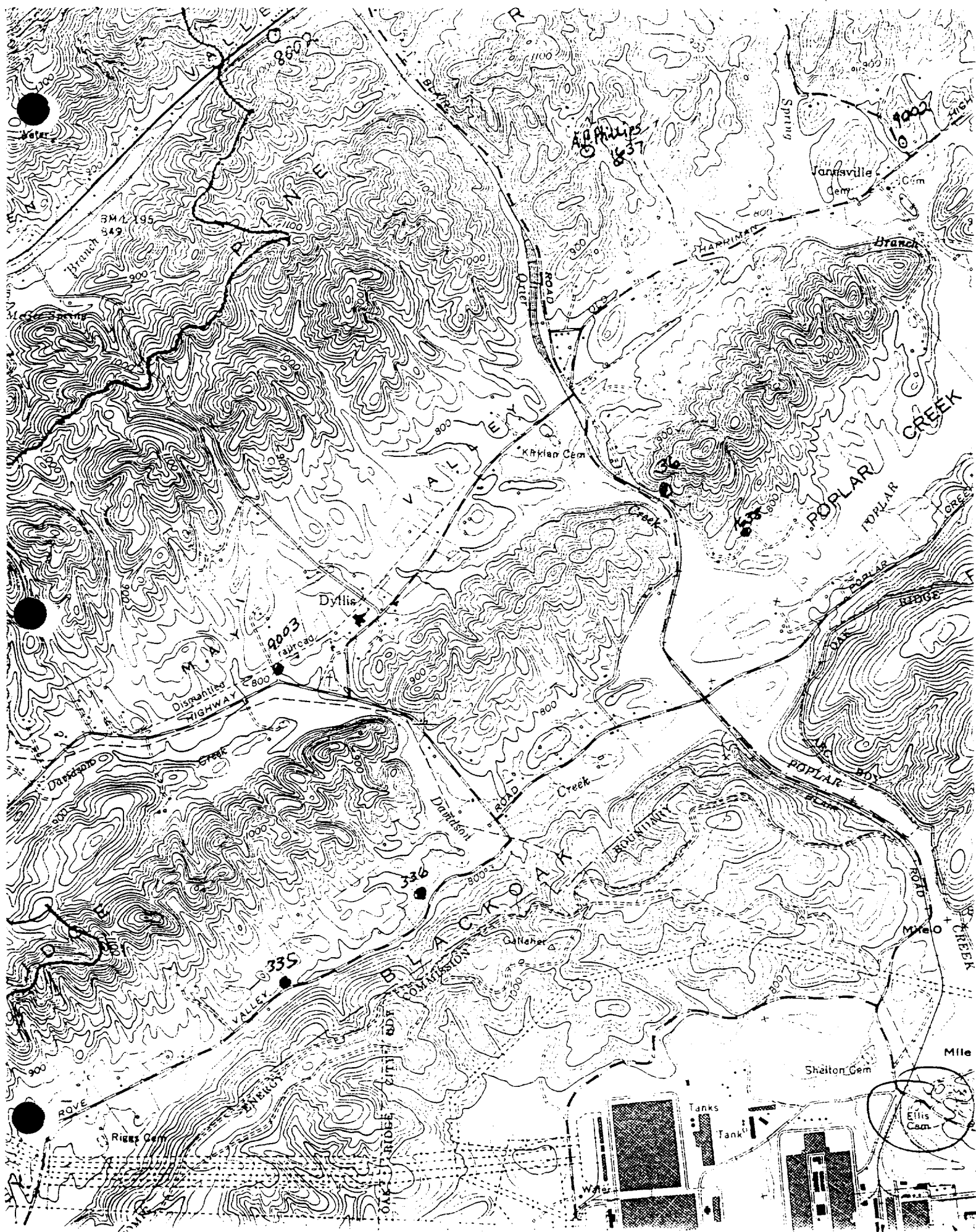


Figure 2. Residential Well Map

This is a detailed topographic map of the Oak Ridge Area, labeled as "RESTRICTED". The map features the Clinch River and Bear Creek, with various landmarks and infrastructure marked. Key locations include Union, Gallaher Bridge, Pumping Station, and the Gallaher Ferry. The map also shows the Clinch River Reservoir and the Bear Creek Reservoir. Elevation contours are shown, with markers for 900, 800, and 700 feet. A scale bar indicates distances in miles, with markers for 0, 1, and 2 miles. The map is oriented with North at the top.

Figure 2. Residential Well Map

Table 1. Information Requirements Checklist - General Information

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(1)	General description of facility	B-1
270.14(b)(2) and (3)	Chemical and physical analyses of wastes	C-1
270.14(b)(4)	Access control and security description of active portion	F-1
270.14(b)(5), 270.147(d), and 270.21(d)	General inspection schedule and procedures	F-1
270.14(b)(6)	Preparedness and prevention documentation	F-3 to F-5
270.14(b)(7)	Contingency plan	G
270.14(b)(8)	Preventive procedures	F-4
270.14(b)(11) (i) and (ii)	Facility location information	B-1, B-2
270.14(b)(13)	Closure plan	I-1
270.14(b)(13)	Post-closure care plan	I-2
270.14(b)(17)	Documentation of insurance	N/A (see I-5 to I-9)
270.14(b)(19) and 270.17(a)	Topographic map (site plotted on USGS quadrangle maps)	B-2
270.21(a) and 270.17(a)	List of wastes placed or to be placed in each unit	D-4



Table 1. (Continued)

Regulation	Description	Location in RCRA Permit Application
<u>Additional Information</u>		
	Existing risk assessment reports and information, including liability insurance analyses, claims, and settlements	EIR
	Land use and zoning map(s) for an area of 4 miles around the unit	
	Existing aerial photographs of the facility	N/A
	Identify and summarize any waste analysis data not already submitted; provide additional data as discussed in text	C (EIR)
	Current estimate of annual amount of waste received and description of any pretreatment process used	C (EIR)
	Identification of any federal, state, or local inspection or compliance records related to environmental and health programs; include descriptions of any major violations	EIR

D366 L-T-1/L-T-1.1

Table 2. Incremental Population Table in the Vicinity of ORNL<sup>a</sup>

DISTANCE, MILES DISTANCE, KM	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
	0-1.6	1.6-3.2	3.2-4.8	4.8-6.4	6.4-8.0	8-16	16-32	32-48	48-64	64-80
Direction										
E	0	0	0	0	0	2,615	50,183	113,337	16,826	16,354
ENE	0	0	0	0	0	0	39,418	79,791	18,513	15,796
NE	0	0	0	0	0	7,336	13,865	9,518	7,239	7,152
NNE	0	0	0	0	874	14,789	7,922	11,412	16,554	9,100
N	0	0	0	0	1,887	4,793	1,971	3,732	5,106	6,545
NNW	0	0	0	0	0	3,187	2,426	2,246	6,830	6,156
NW	0	0	0	0	0	1,964	2,717	2,340	3,303	6,315
WNW	0	0	0	0	0	1,364	4,559	2,336	3,385	4,431
W	0	0	0	0	0	1,804	13,807	5,707	10,627	9,922
WSW	0	0	0	0	0	2,078	9,447	6,387	6,808	4,690
SW	0	0	0	0	0	1,066	2,257	3,422	6,691	13,983
SSW	0	0	0	0	0	1,307	3,321	10,843	24,040	13,900
S	0	0	0	0	0	4,704	7,719	7,810	6,861	3,750
SSE	0	0	0	0	329	4,554	5,451	4,180	1,461	2,590
SE	0	0	0	0	0	3,519	6,739	20,096	1,000	1,689
ESE	0	0	0	0	0	3,740	12,447	37,901	6,319	10,958
TOTAL	0	0	0	0	3,090	58,820	184,249	320,158	141,563	133,331
CUMULATIVE TOTAL	0	0	0	0	3,090	61,910	246,159	566,317	707,880	841,211

<sup>a</sup>Based on 1980 Census Data.

Table 3. Summary of Waste Information

Hazardous Waste	Hazard	Basis	
K-1407-A Treatment Tank precipitates	EP toxic	Listed waste F006 Cd > 1.0 mg/L (D006) Cr > 5.0 mg/L (D007) Pb > 5.0 mg/L (D008) Miscellaneous waste <sup>a</sup>	
K-1501 steam plant water softener	Corrosive	pH<2.0	(D002)
K-1501 coal pile runoff	Corrosive	pH<2.0	(D002)
K-1420 acid stripping bath effluent	EP toxic	Cd>1.0 mg/l (D006) Cr>5.0 mg/l (D007) Pb>5.0 mg/l (D008)	
K-1420 HCl cleaning bath effluent	EP toxic	Cr>5.0 mg/l (D007) Pb>5.0 mg/l (D008)	
K-1420 metals finishing	EP toxic	Cd>1.0 mg/l (D006) Cr>5.0 mg/l (D007)	

<sup>a</sup>These process wastes consist of a wide variety of wastes that may be classified as EP toxic, corrosive, or toxic. Only small quantities of these wastes will be generated.

D366 L-T-3

Table 4. K-1407-B Organic Effluent Data

Parameter	Minimum	Maximum	Averages
Methylene chloride	≤0.01	≤0.01	≤0.01 ± 0.00
Trichloroethane	≤0.01	≤0.01	≤0.01 ± 0.00
Trichloroethylene	0.01	0.13	0.06 ± 0.01
Perchloroethylene	0.01	0.60	0.09 ± 0.07
Halomethanes	≤0.01	≤0.01	≤0.01 ± 0.00
Freon 113	≤0.01	0.04	≤0.018 ± 0.015
Acetone	0.06	0.18	0.118 ± 0.043
2,2,3,3-tetrachlorohexafluorob	0.02	0.04	0.03 ± 0.02
2-propanol	0.01	0.04	0.02 ± 0.018
1,2-trans-dichloroethylene	0.01	0.02	0.014 ± 0.005

<sup>a</sup>Averages calculated at 95% confidence level.

D366 L-T-4

Table 5. K-1407-B Organic Summary Data (1979-1983)

Parameter	Minimum	Maximum	Averages
Aluminum	0.07	0.88	$0.46 \pm 0.05$
Cadmium	$\leq 0.002$	0.006	$\leq 0.0025 \pm 0.0003$
Chromium	0.005	0.54	$\leq 0.021 \pm 0.017$
COD	$\leq 5.0$	42.0	$14.83 \pm 2.02$
Copper	$\leq 0.004$	0.08	$\leq 0.028 \pm 0.005$
Cyanide	$\leq 0.002$	0.015	$\leq 0.002 \pm 0.0005$
Fluoride	0.20	4.0	$1.17 \pm 0.20$
Lead	$\leq 0.01$	0.03	$\leq 0.013 \pm 0.001$
Manganese	0.002	0.33	$0.09 \pm 0.015$
Mercury	$\leq 0.001$	0.004	$\leq 0.001 \pm 0.0001$
Nickel	0.01	7.68	$0.49 \pm 0.25$
Nitrate	0.40	15.18	$4.98 \pm 0.013$
Sus. solids	$\leq 5.0$	18.0	$\leq 7.56 \pm 0.92$
Uranium	0.02	3.63	$0.54 \pm 0.15$
Zinc	$\leq 0.02$	0.30	$0.045 \pm 0.013$

<sup>a</sup>Averages calculated at 95% confidence level.

D366 L-T-5

Table 6. Information Requirements Checklist - Ground Water Pathway

Regulation	Description	Location i RCRA Permi Applicatio
<u>Information in Part B Application</u>		
270.14(c)(1)	Interim status ground-water monitoring results	E-1
270.14(c)(2)	Identification of uppermost aquifer, including flow rate and direction	E-2
270.14(c)(3) and 270.14(b)(19)	Topographic maps related to ground water protection (well location, water table elevation contours, etc.)	EIR
270.14(c)(4) (i) and (iii)	Description of existing contamination	EIR
270.14(c)(5)	Detailed plans for ground water monitoring program	E-4
270.14(c)(6)	Description of detection monitoring program (if applicable)	N/A
270.14(c)(7) and (c)(7)(ii)	Description of compliance monitoring program and characterization of contaminated ground water (if applicable)	E-4, E-5
270.14(c)(7)(iv)	ACL demonstration (if any)	N/A
270.14(c)(8)	Corrective action program (if applicable)	N/A
270.17(b)(1) 270.21(b)(1)	Description of liner and leachate collection systems (if applicable)	N/A

Table 6. (Continued)

Regulation	Description	Location in RCRA Permit Application
<u>Additional Information</u>		
	Existing map showing location of all known wells within three miles; number and location of drinking water wells	EIR
	Discussion of ground water uses within three miles of unit	EIR
	Regional map showing areas of ground water recharge and discharge	EIR
	Net precipitation using net seasonal rainfall or other available data	EIR
	Unless otherwise reported to EPA, available well data indicating a release, and information on any affected public or private water supplies, including populations served	EIR
	Any known foot chain contamination due to prior release from the unit to ground water	EIR

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Table 7. Information Requirements Checklist - Surface Water Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(11)(iii) thru (v)	Location information related to 100 yr flood plain including variance demonstrations	N/A (see EIR)
270.21(b)(2)	System for control of run-on from each peak discharge of 25 yr storm	N/A
270.21(b)(3)	System for control of run-off from 24 hr, 25 yr storm	N/A
270.17(b)(2)	Procedures/equipment to prevent overtopping	D-4e
270.17(b)(3)	Structural integrity of dikes	D-4f
<u>Additional Information</u>		
	Discussion of surface-water uses within three miles of the unit, including a map showing the location of all surface water bodies and downstream drinking water intakes	EIR
	Velocities of streams and rivers passing through and adjacent to the property	EIR
	Description of any system used to monitor surface water quality, and a summary of the data	EIR
	Description of known releases to surface water; the extent of contamination; remedial action, if any; and if known, severity of impact.	EIR
	Any known food-chain contamination resulting from the unit to surface water	EIR



Table 8. Information Requirements Checklist - Air Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(9) 270.21(f) and (g), 270.21(h) and (i)	Documentation of procedures to prevent accidental ignition or reaction	N/A
270.21(b)(5)	Plans to control wind dispersal of particulate matter at landfills	N/A
270.14(b)(19)(v)	A wind rose showing prevailing windspeed and direction	Fig. B-1
<u>Additional Information</u>		
	Summary of air monitoring data and a description of current monitoring system, if any	EIR
	Population within a four mile radius of the unit	EIR
	Describe any known releases to air; the extent of contamination; remedial action, if any; and severity of impact, if known	EIR

Table 9. Information Requirements Checklist - Contaminated Soil Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
None in addition to General Information Requirements		
<u>Additional Information</u>		
	If soil sampling has been done, a map showing areas of soil contamination, and a summary of analytical results	N/A
	Description of the types of major releases that resulted in soil contamination, and any clean-up action	EIR
	Any known food-chain contamination resulting from the use of contaminated soils for raising crops	N/A

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TABLE 10  
Analyses of Subsurface Soil Under K-1407-B

Oak Ridge Gaseous Diffusion Plant  
Analytical Chemistry Department  
Results of Analyses

Customer Name: BOWERS  
Customer Sample Number: K-1407B A-COMP Lab Sample Number: 850509-051  
Date Sample Received: 09-MAY-1985 Date Sample Completed: 30-MAY-1985  
Material Description: K-1407B CLAY (A) COMPOSITE Req. Number:

Act. No.	Preparation Procedure No.	Analysis Procedure No.	Analysis	Result	Units	Analyst	Date Complete
1392	EPA-3540	TP-1392	Soil Extraction	COMP.		RM MACK	20-MAY-19
2402	EPA-625	EPA-625	1,2,4-trichlorobenzene	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	1,2-dichlorobenzene	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	1,2-diphenylhydrazine	<0.006	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	1,3-dichlorobenzene	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	1,4-dichlorobenzene	<0.004	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2,4,6-trichlorophenol	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2,4-dichlorophenol	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2,4-dimethylphenol	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2,4-dinitrophenol	<0.042	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2,4-dinitrotoluene	<0.006	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2,6-dinitrotoluene	<0.006	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2-chloronaphthalene	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2-chlorophenol	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2-methyl-4,6-dinitrophenol	<0.024	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	2-nitrophenol	<0.004	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	3,3'-dichlorobenzidine	<0.017	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4,4'-DDD	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4,4'-DDE	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4,4'-DDT	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4-bromophenyl phenyl ether	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4-chloro-3-methylphenol	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4-chlorophenyl phenyl ether	<0.004	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	4-nitrophenol	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1016	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1221	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1232	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1242	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1248	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1254	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	PCB-1260	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	acenaphthene	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	acenaphthylene	→ 0.053	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	aldrin	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	alpha-BHC	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	anthracene	<0.002	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzidine	<0.044	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzo(a)anthracene	<0.008	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzo(a)pyrene	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzo(b)fluoranthene	<0.005	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzo(ghi)perylene	<0.004	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzo(k)fluoranthene	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	benzyl butyl phthalate	<0.003	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	beta-BHC	<0.010	ug/g	GJ PARDUE JR	30-MAY-19
	EPA-625	EPA-625	bis(2-chloroethoxy)methane	<0.005	ug/g	GJ PARDUE JR	30-MAY-19

TABLE 10  
Analyses of Subsurface Soil Under K-1407-B

Oak Ridge Gaseous Diffusion Plant  
Analytical Chemistry Department  
Results of Analyses

Customer Name: BOMERS  
Customer Sample Number: K-1407B A-COMP Lab Sample Number: 850509-051  
Date Sample Received: 09-MAY-1985 Date Sample Completed: 30-MAY-1985  
Material Description: K-1407B CLAY (A) COMPOSITE Req. Number:

Act. No.	Preparation Procedure No.	Analysis Procedure No.	Analysis	Result	Units	Analyst	Date Comple
	EPA-625	EPA-625	bis(2-chloroethyl)ether	<0.006	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	bis(2-chloroisopropyl)ether	<0.006	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	bis(2-ethylhexyl)phthalate	<0.003	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	chlordan	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	chrysene	<0.003	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	delta-BHC	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	di-n-butyl phthalate	→ 0.38	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	di-n-octyl phthalate	<0.003	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	dibenzo(a,h)anthracene	<0.003	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	dieldrin	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	diethylphthalate	<0.020	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	dimethylphthalate	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	endosulfan I	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	endosulfan II	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	endosulfan sulfate	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	endrin	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	endrin aldehyde	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	fluoranthene	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	fluorene	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	gamma-BHC	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	heptachlor	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	heptachlor epoxide	<0.010	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	hexachlorobenzene	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	hexachlorobutadiene	<0.001	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	hexachlorocyclopentadiene	<0.006	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	hexachloroethane	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	indeno(1,2,3-cd)pyrene	<0.004	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	isophorone	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	n-nitrosodi-n-propylamine	<0.006	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	n-nitrosodimethylamine	<0.006	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	n-nitrosodiphenylamine	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	naphthalene	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	nitrobenzene	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	pentachlorophenol	<0.004	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	phenanthrene	<0.005	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	phenol	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	pyrene	<0.002	ug/g	GJ PARDUE JR	30-MAY-1
	EPA-625	EPA-625	toxaphene	<0.010	ug/g	GJ PARDUE JR	30-MAY-1

Approved By: LW MCMAHON  
Date Approved: 30-MAY-1985

\*\*\*\*\* COMMENTS FROM THE ORGANIC MASS SPECTROSCOPY LABORATORY \*\*\*\*\*

TABLE 10  
Analyses of Subsurface Soil Under K-1407-B

Oak Ridge Gaseous Diffusion Plant  
Analytical Chemistry Department  
Results of Analyses

Customer Name: BOWERS  
Customer Sample Number: K-1407B A-COMP      Lab Sample Number: 850509-051  
Date Sample Received: 09-MAY-1985      Date Sample Completed: 30-MAY-1985  
Material Description: K-1407B CLAY (A) COMPOSITE      Req. Number:

Act. No.	Preparation Procedure No.	Analysis Procedure No.	Analysis	Result	Units	Analyst	Date Completed
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This sample is associated with blank # 850509-051.  
The sample results are based on a dry weight basis.

EPA METHOD 625 SURROGATE STANDARDS

STANDARD	% RECOVERY
phenol d5	87.7
pentafluorophenol	125.1
1-fluoronaphthalene	72.6
4-4 dibromobiphenyl	58.1

Major identified organic components:

carbitol  
hydrocarbons

Table 11. Information Requirements Checklist - Transportation Information

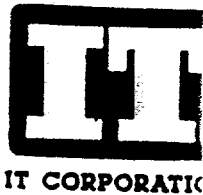
Regulation	Description	Location i RCRA Permi Applicatio
<u>Information in Part B Application</u>		
270.14(b)(10)	Traffic pattern, volume, and controls; access road characteristics	B-4
<u>Additional Information</u>		
	Description of the types and capacities of vehicles used to transport waste	EIR
	Identification of normal transport routes for hazardous waste into the site and within one mile of the facility entries	N/A
	Description of procedures for clean-up of transportation-related spills or leaks	EIR
	Descriptions of any transportation accidents releasing hazardous wastes on-site, or in the immediate vicinity	EIR

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Table 12. Information Requirements Checklist - Management Practices Information

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(12) 264.16	Outline of programs to train employees to safely operate and maintain facility, including emergency response activities	H
<u>Additional Information</u>		
	Summary of existing records on worker illness or injury, related to the operation of the unit; include summaries of Workman's Compensation claims, or hospital records	EIR

D366 L-T-13



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# EXPOSURE INFORMATION REPORT

FOR THE RCRA 1984 AMENDMENTS - SECTION 3019

K-1407-C  
RETENTION BASIN

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U.S. Department Of Energy  
K-25 Facility  
Oak Ridge, Tennessee

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Prepared for:  
Martin Marietta Energy Systems, Inc.  
Oak Ridge Gaseous Diffusion Plant  
Post Office Box P  
Oak Ridge, Tennessee 37831

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## EXPOSURE INFORMATION REPORT (EIR)

### 1.0 INTRODUCTION

Under the recently enacted Hazardous and Solid Waste Amendments of 1984, Part B permit applications for RCRA hazardous waste landfills and surface impoundments must include an Exposure Information Report (EIR), as required in Section 3019. If the application was submitted after November 8, 1984, the EIR must be submitted to EPA or the authorized state agency by the submittal date for the Part B application.

This EIR contains exposure information relevant to the K-1407-C Retention Basin at the ORGDP (K-25) facility of the U.S. Department of Energy in Oak Ridge, Tennessee. The purpose of the EIR is to define the potential for chemical exposure to human and non-human populations that may result from known or predicted releases of contaminants into the environment.

The following sections will characterize the potential for exposure:

- General Information
- Pathways - Specific Information
- Exposure Potential

### 2.0 GENERAL INFORMATION

This section of the EIR includes:

- Completed RCRA Part B information requirements checklist
- Existing risk assessment reports information
- Surrounding land use and potentially exposed populations
- Waste characterization data
- Compliance records.

#### 2.1 INFORMATION REQUIREMENTS CHECKLIST

Table 1 is a completed information requirements checklist correlating the RCRA permit application sections that contain the required exposure/facility information. Where the information items are not relevant, "N/A" (or not applicable) is marked. Items that are described in this exposure information report are marked "EIR."

## 2.2 EXISTING RISK ASSESSMENT REPORTS

There are no existing risk assessment reports pertaining to the K-1407-C Retention Basin.

## 2.3 SURROUNDING LAND USE AND POTENTIALLY EXPOSED POPULATIONS

The region near the K-25 facility encompasses areas of residential, agricultural, industrial, and recreational uses.

The ORGDP (K-25) facility is surrounded by five counties: Anderson, Knox, Loudon, Morgan, and Roane, which had a combined 1975 population of 437,600. There are two major population centers within 50 miles of the site: the city of Oak Ridge (1970 population - 28,319), which borders the northern side of the facility, and the city of Knoxville (1970 population - 174,587), which is about 25 miles east of the site. Figure 1 shows communities with populations over 1500 that are within 60 miles of the site. Table 2 lists populations around the Oak Ridge National Laboratory, which is approximately 2 miles to the southeast. The area has a low population density primarily because of the federal land. The nearest privately owned land is about 2 miles west and 1 mile north of the K-25 facility.

Agricultural land use has decreased steadily, following a national trend. There are no commercial dairy farms within the 10-mile radius in Morgan, Anderson, or Knox counties; there are four in Roane county and one in Loudon county (DOE 1979). Commercial forest land accounts for more than half of the land area in the surrounding five counties.

Among industrial land users in a 10-mile radius are three DOE plants, which employ about 15,000 people. Three small industrial activities are also located west of the ORGDP (K-25) site in the Clinch River Consolidated Industrial Park.

A limited number of recreational facilities are located within a 10-mile radius. Two commercial camping areas (30- and 100-unit) are 4 and 6 miles southeast of the facility, respectively. A small race track is about 3 miles southeast of the facility. There are no hunting areas in the immediate vicinity of the site nor are there any wildlife preserves or sanctuaries. The area has been opened to deer hunting this year.

## 2.4 WASTE CHARACTERIZATION DATA

The K-1407-C Sludge Retention Basin has a storage volume of approximately 2.5

million gallons. This impoundment is used primarily for storing potassium hydroxide scrubber sludges generated at the ORGDP (K-25) facility. K-1407-C also contains metal hydroxide sludges that were removed from the K-1407-B settling pond; however, these wastes have not been placed in the K-1407-C basin for a number of years. The K-1407-C Sludge Retention Basin is scheduled to be closed by November 8, 1988. The present plan is to transfer all sludges in the K-1407-C basin to the K-1419 fixation unit upon closure. Table C-1 lists the hazardous waste streams that are stored in the K-1407-C Sludge Retention Basin.

Table 3 summarizes pertinent information concerning the hazardous wastes that are stored at the K-1407-C basin. This table lists the hazardous wastes that are stored at the facility, their associated hazard classification, and the basis for that classification. In some cases the classification is based on applying knowledge of the hazardous characteristics of the waste and knowledge of the materials or processes used. For listed wastes, the classification is based on the listing. Typical analyses for the wastes contained in K-1407-C are given in Appendix C.

The K-1407-C basin was sampled and analyzed in April and May of 1985; the results from this sampling are given in Appendix C. The ORGDP (K-25) site plans to close the K-1407-C basin by November 8, 1988. The waste streams entering this impoundment will not change significantly and sufficient information is available for their safe handling; therefore, ORGDP (K-25) does not plan to sample and analyze the waste in the K-1407-C basin unless this is determined to be necessary. The data given in Appendix C represent analytical results from the sampling of the sludges and subsoils in the impoundment. The ground water monitoring program is discussed in Section E.

## 2.5 COGNIZANT ENFORCEMENT AUTHORITY AND COMPLIANCE RECORDS

The K-1407-C Retention Pond is subject to compliance inspections by the Tennessee State Department of Health and Environment, under the Rules Governing Hazardous Waste Management in Tennessee. The NPDES discharge is also regulated by the same state department. Inspection and compliance records will be found in the Nashville, Tennessee office.

There have been no known releases of contaminants or major violations associated with K-1407-C.

### 3.0 PATHWAY - SPECIFIC INFORMATION

This section contains information pertaining to site specific transport pathways for contaminants both on and off site. It is designed to supplement information already provided in the Part B application. Pathways include: ground water, surface water, air, contaminated soil, and subsurface gas.

#### 3.1 GROUND WATER PATHWAY

Table 4 contains that part of the information requirements checklist pertaining to the ground water pathway.

##### 3.1.1 General Hydrogeologic Information

Information regarding hydrogeologic conditions at the ORGDP (K-25) site is limited and general in scope. No detailed hydrogeologic studies have been made at the site. General hydrogeologic information is contained in Section E.2 of the Part B application.

##### 3.1.2 Existing Contamination

There is no known existing contamination in the ground water systems at K-25. Due to the relatively low permeability and primary porosity of the soils, any contaminants, particularly heavy metals, would be retarded in their movement. From analysis of preliminary hydrogeological data it appears that hydrologic gradient is towards Poplar Creek, which serves as a natural hydrologic barrier to ground water flow.

##### 3.1.3 Ground Water Uses

Because of the rural setting of the ORGDP (K-25) site and the fact that little industry is close to the site, the primary use for ground water is for domestic purposes. There are a limited number of residential wells, and Figure 1 is a map showing those wells within a three-mile radius of the K-1407-C unit. Most of the area within a 3-mile radius is U.S. government land with restricted access. There are no known drinking wells on K-25 property. The nearest wells are approximately 2 miles west and 1 mile north of the site. These wells are effectively segregated from ground water under the site by the Poplar Creek, which receives water from ground water systems to its north (i.e., residential) and from the south (i.e., K-25 facility).

##### 3.1.4 Ground Water Discharge and Recharge Areas

As evidenced in Figure 1, the site area is characterized with well-defined

valleys and ridges. The ORGDP (K-25) facility is in a valley surrounded by a pine ridge to the south, McKinney Ridge to the east, Black Oak Ridge to the north, and the Clinch River and Poplar Creek to the west. The entire pervious surface of this valley serves as a recharge area. Water infiltrates into the soil and is most likely discharged into the Poplar Creek or Clinch River.

#### 3.1.5 Net Precipitation

The 20-year (1951-1971) average annual rainfall precipitation rate for the Oak Ridge area is 53.5 inches. The mean annual lake evaporation for the Oak Ridge area is taken from the National Weather Service (Linsley, et al., 1975) and is estimated to be 34-36 inches.

The annual net precipitation will range from 17.5 to 19.5 inches.

### 3.2 SURFACE WATER PATHWAY

Table 5 contains the information requirements checklist for the surface water pathway. Figure 1 shows the location of all surface water bodies within the 3-mile radius of the site.

#### 3.2.1 Flood Hazard

The pond is not in the 100-year flood area (see map 6, Appendix B).

#### 3.2.2 Surface Water Use

There are no direct drinking water intakes downstream of the K-25 facility within the 3-mile radius of the site on the Clinch River. K-25 has a drinking water intake on the Clinch River upstream from the confluence with Poplar Creek. The Clinch River is used for navigation and recreational purposes (swimming, boating, and sport fishing).

#### 3.2.3 River Velocities

River flow for Poplar Creek for the lowest three consecutive day flow for 20 years of data (3Q<sub>20</sub>) was 6.4 cubic feet per second. Similar data for the Clinch River upstream of the Gallahar Dam (the nearest gage station) were not available. This information is available for the Melton Hill Lake downstream below the Gallahar Dam.

#### 3.2.4 Surface Water Quality

Surface water quality data have been taken at points in Poplar Creek and in the Clinch River, primarily to provide information on background concentrations.

### 3.2.5 Surface Water Releases

There have not been any known releases from the retention pond.

### 3.2.6 Food Chain Contamination

There is recreational fishing on the Clinch River, but probably not in Poplar Creek. No commercial fishing takes place within the 3-mile radius.

## 3.3 AIR PATHWAY

Table 6 contains the information requirements checklist for the air pathway. Wind roses (seasonal) for the ORGDP (K-25) area are presented in Figure 1, Section B of the Part B application.

### 3.3.1 Air Monitoring Data

No air monitoring data have been taken near the K-1407-C retention pond. The only air monitoring data that have been collected were to determine background levels of particulates and fluorides on site.

### 3.3.2 Population Distribution

Table 2 provides incremental population levels in the vicinity of the Oak Ridge National Laboratory (ORNL). ORNL is approximately 3.5 miles southeast of the K-25 facility. Population by counties is given in Section 2.3.

### 3.3.3 Air Releases

The K-1407-C Retention Pond is an open impoundment containing inorganic constituents. These constituents will not volatilize and be released via the air pathway.

## 3.4 SUBSURFACE GAS PATHWAY

This pathway is not applicable to the K-1407-C Retention Pond.

## 3.5 CONTAMINATED SOIL PATHWAY

Table 9 contains the information requirements checklist for the contaminated soil pathway. Soil samples have been taken in K-1407-C. Analyses of the soil are presented in Section C of the Part B application. Ground water chemical analyses have not been conducted.

## 3.6 TRANSPORTATION INFORMATION

Table 8 contains the information requirements checklist for the transportation information. No wastes involved with K-1407-C are transported off site.

### 3.7 MANAGEMENT PRACTICE INFORMATION

Table 9 contains the information requirements checklist for management practice information. Section H contains information on personnel training and emergency response activities. No workers have been injured or become ill as a result of the K-1407-C operation.

### 4.0 EXPOSURE POTENTIAL

#### 4.1 INTRODUCTION

This section describes the potential exposure of contaminants in and potentially released by the K-1407-C Retention Pond.

Two potentially exposed populations are identified: residential and occupational. Residential population distribution is described in Section 2.3. The occupational population at the ORGDP (K-25) facility is presently 3200 workers, but this number will decrease when the facility is placed in standby. No employees work continuously within 20 yards of the K-1407-C unit. This subset would constitute the occupational population that is potentially exposed.

Exposure pathways, analogous to transport pathways, are described. They include: ingestion of ground water, ingestion of and contact with surface water, inhalation of air, subsurface gas, contact with contaminated soil, transportation related, and worker/management practice related.

#### 4.2 INGESTION OF GROUND WATER

Ingestion of contaminated ground water is not considered to be an important exposure pathway for either the occupational or residential populations. There are no drinking water wells on site, so the occupational population is not exposed. Similarly, local topography and regional geologic information indicate that subsurface flow near K-1407-C discharges into Poplar Creek. Subsurface flow from off site (south of Black Oak Ridge to the north) probably discharges into Poplar Creek also. The only residential wells near the K-1407-C basin are north of this ridge in another watershed. Figure 2 shows the location of these wells. Even if new wells were installed south of Black Oak Ridge, there would be no potential exposure, since Poplar Creek is an effective hydrologic barrier. Any contaminated flow from the basin would be intercepted by the creek, thus preventing the wells from pumping contaminated water. A ground water monitoring system is scheduled to be installed in the near future. This should better

characterize the ground water system under the basin and provide an early warning capability for detection of leaching and subsequent contaminant plumes.

#### 4.3 SURFACE WATER

There are two potential modes of exposure with contaminated surface water: ingestion (drinking) and dermal contact (swimming). A greater potential risk of exposure is via the surface water pathway rather than via the ground water pathway because Poplar Creek hydrologic barrier and potential receptors do exist.

For the occupational population the potential exposure is very low, because Poplar Creek is not used for swimming or drinking purposes. A small segment of the residential population could potentially be exposed. In terms of dermal contact during swimming, the only areas where this may occur would be upstream of the basin on Poplar Creek, or downstream in the Clinch River. In either case, exposure would be negligible, as the upper Poplar Creek cannot receive any contaminants from the basin, and the dilution of flow from the Clinch River would reduce concentrations down to a very low level.

Potential exposure through ingestion of contaminated surface water is also expected to be very low. Poplar Creek is not a source of potable water. The nearest drinking water intake on the Clinch River is beyond the 3-mile radius of the site downstream, so dilution effects of the river should reduce the concentrations of any contaminants released from K-1407-C via contaminated runoff into Poplar Creek. The fact that all the inorganic constituents such as cadmium and lead analyzed in K-1407-C were extremely low and have limited mobility in the environment further substantiates that contaminants in the surface water would be extremely low.

#### 4.4 AIR

The mode of potential exposure via the air pathway is inhalation of vapors and particulates or fugitive dust. Organic constituents that can volatilize and be diluted on site offer some potential exposure to the population. This potential is very small, however, as concentrations in the supernatant of the basin are very low. Concentrations this low will be diluted to negligible levels upon volatilization. Potential exposure to residential populations will be even lower due to the additional dilution effects of advection and dispersion as the vapors are carried downwind.



Potential exposure to fugitive dust emissions may be important because the basin is partially exposed to the air. There is the potential for the sludge to dry out and be susceptible to erosion and fugitive dust emission.

#### 4.5 SUBSURFACE GAS

This exposure pathway is not applicable to K-1407-C.

#### 4.6 CONTAMINATED SOILS

The potential for exposure from contaminated soils is extremely low. Exposure in this case would be as a result of dermal contact with contaminated soils. There have been no known spills of contaminants from K-1407-C. In addition, no potential receptors, such as children playing, exist on site.

#### 4.7 TRANSPORTATION-RELATED EXPOSURE

No waste is transported off site from K-1407-C.

There is potential exposure by means of inhalation of volatilizing vapors and dermal contact with the sludge. Workers wear protective clothing, and concentrations of contaminants, including EP TOX ones, are so low that inhalation or contact should be unimportant. Workers do not handle sludge. This may be of concern when sludge transferred to the concrete fixation plant.

#### 4.8 WORKER-MANAGEMENT PRACTICES

There are no workers who are constantly on site at the K-1407-C pond. The ORGDP (K-25) facility has an occupational industrial hygiene program to address the worker health needs, and emergency training and response for occupational exposure.

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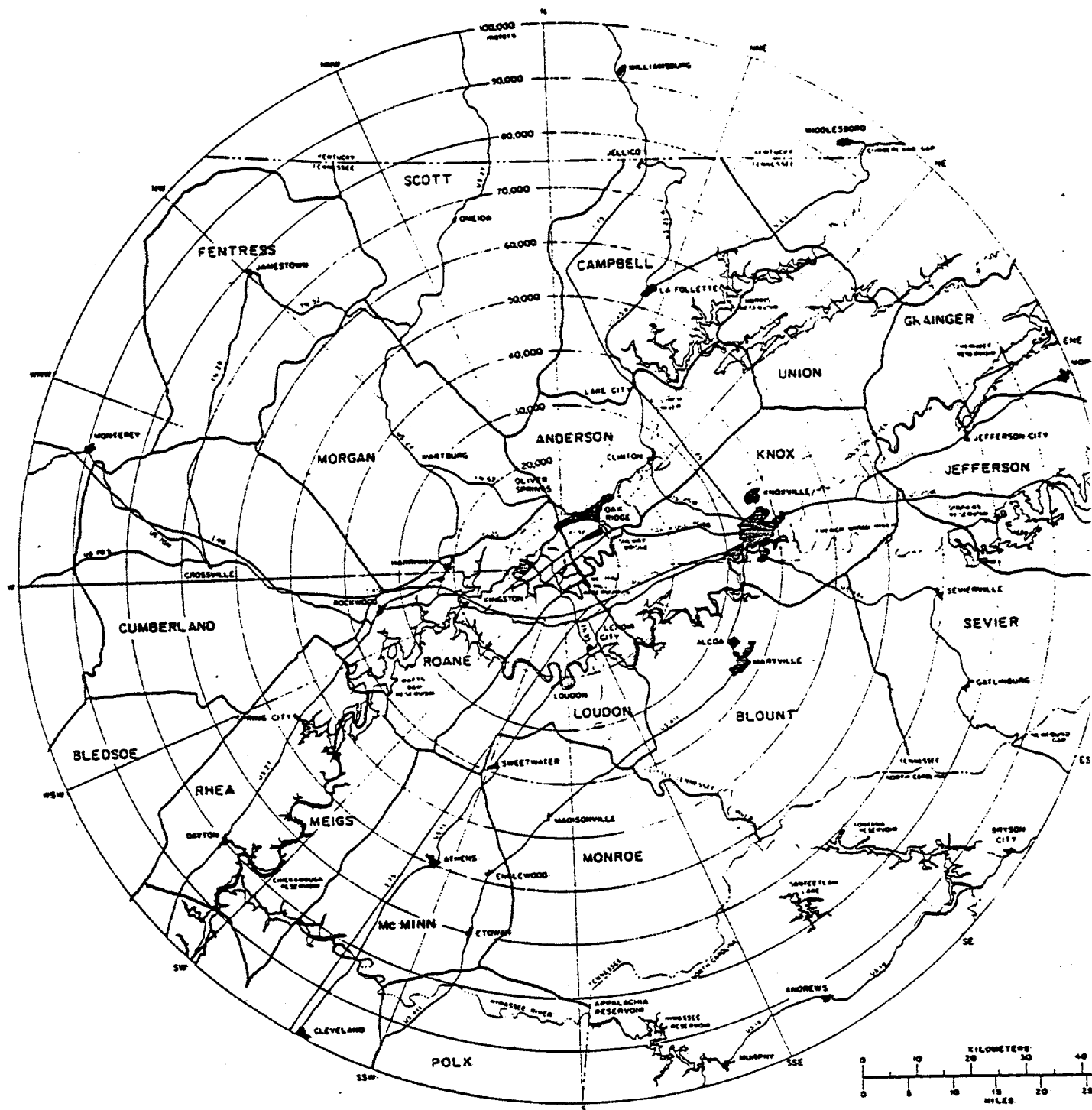


Figure 1. Communities with a population greater than 1500 within a 100-km radius (60 miles) of the Oak Ridge Reservation.



Figure 2 Residential Well Map

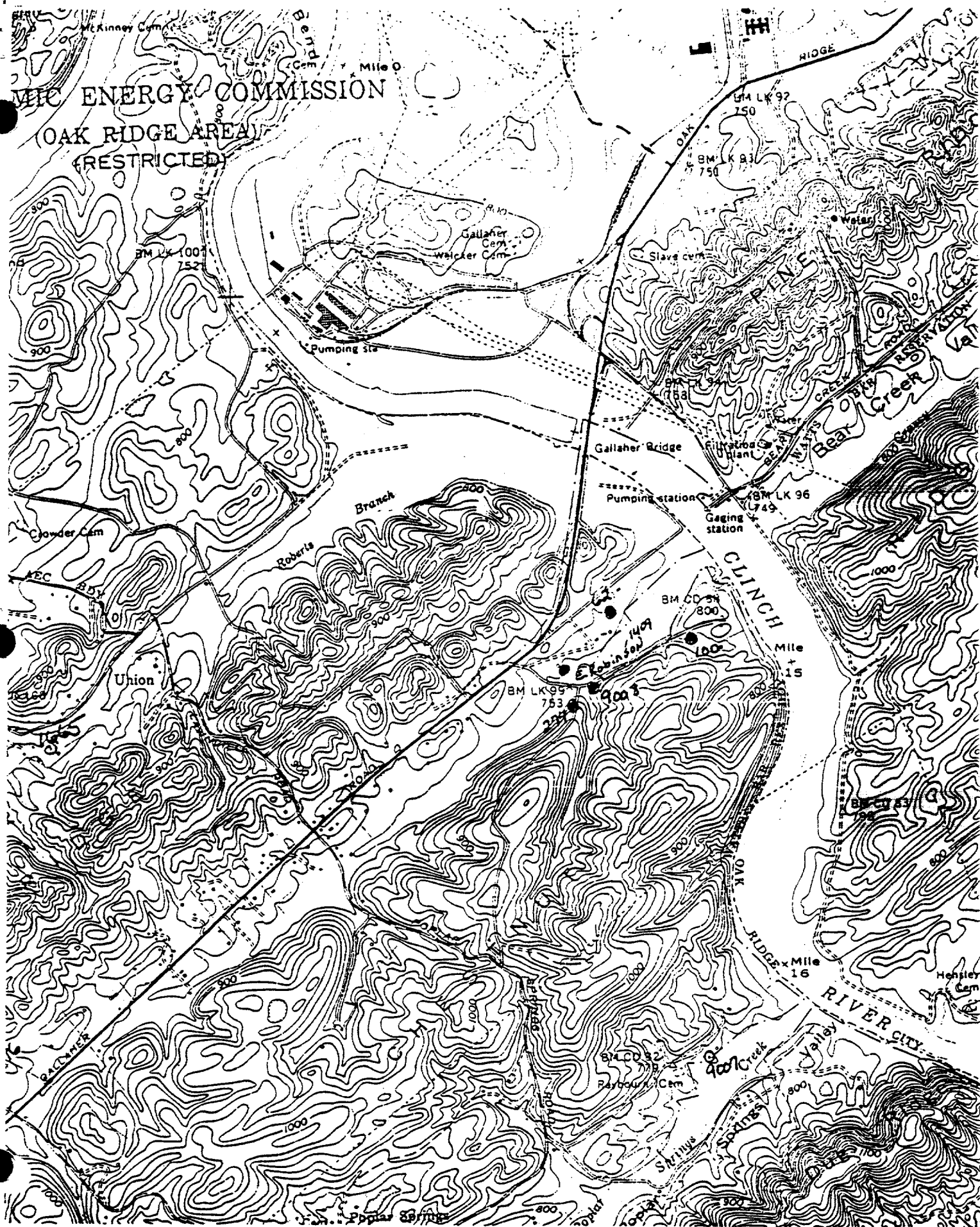


Figure 2. Residential Well Map

Table 1. Information Requirements Checklist - General Information

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(1)	General description of facility	B-1
270.14(b)(2) and (3)	Chemical and physical analyses of wastes	C-1
270.14(b)(4)	Access control and security description of active portion	F-1
270.14(b)(5), 270.147(d), and 270.21(d)	General inspection schedule and procedures	F-1
270.14(b)(6)	Preparedness and prevention documentation	F-3 to F-5
270.14(b)(7)	Contingency plan	G
270.14(b)(8)	Preventive procedures	F-4
270.14(b)(11) , i) and (ii)	Facility location information	B-1, B-2
270.14(b)(13)	Closure plan	I-1
270.14(b)(13)	Post-closure care plan	I-2
270.14(b)(17)	Documentation of insurance	N/A (see I-5 to I-9)
270.14(b)(19) and 270.17(a)	Topographic map (site plotted on USGS quadrangle maps)	B-2
270.21(a) and 270.17(a)	List of wastes placed or to be placed in each unit	D-4

Table 1. (Continued)

Regulation	Description	Location in RCRA Permit Application
<u>Additional Information</u>		
	Existing risk assessment reports and information, including liability insurance analyses, claims, and settlements	EIR
	Land use and zoning map(s) for an area of 4 miles around the unit	
	Existing aerial photographs of the facility	N/A
	Identify and summarize any waste analysis data not already submitted; provide additional data as discussed in text	C (EIR)
	Current estimate of annual amount of waste received and description of any pretreatment process used	C (EIR)
	Identification of any federal, state, or local inspection or compliance records related to environmental and health programs; include descriptions of any major violations	EIR

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Table 2. Incremental Population Table in the Vicinity of ORNL<sup>a</sup>

DISTANCE, MILES	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
DISTANCE, KM	0-1.6	1.6-3.2	3.2-4.8	4.8-6.4	6.4-8.0	8-16	16-32	32-48	48-64	64-80
Direction										
E	0	0	0	0	0	2,615	50,183	113,337	16,826	16,354
ENE	0	0	0	0	0	0	39,418	79,791	18,513	15,796
NE	0	0	0	0	0	7,336	13,865	9,518	7,239	7,152
NNE	0	0	0	0	874	14,789	7,922	11,412	16,554	9,100
N	0	0	0	0	1,887	4,793	1,971	5,732	5,106	6,545
NNW	0	0	0	0	0	3,187	2,426	2,246	6,830	6,156
NW	0	0	0	0	0	1,964	2,717	2,340	3,303	6,315
WNW	0	0	0	0	0	1,364	4,559	2,336	3,385	4,431
W	0	0	0	0	0	1,804	13,807	5,707	10,627	9,922
WSW	0	0	0	0	0	2,078	9,447	6,387	6,808	4,690
SW	0	0	0	0	0	1,066	2,257	3,422	6,691	13,983
SSW	0	0	0	0	0	1,307	3,321	10,843	24,040	13,900
S	0	0	0	0	0	4,704	7,719	7,810	6,861	3,750
SSE	0	0	0	0	329	4,554	5,451	4,180	1,461	2,590
SE	0	0	0	0	0	3,519	6,739	20,096	1,000	1,689
ESE	0	0	0	0	0	3,740	12,447	37,001	6,319	10,958
TOTAL	0	0	0	0	3,090	58,820	184,249	320,158	141,563	133,331
CUMULATIVE TOTAL	0	0	0	0	3,090	61,910	246,159	566,317	707,880	841,211

<sup>a</sup>Based on 1980 Census Data.

Table 3. Summary of Waste Information

Hazardous Waste	Hazard	Basis
K-1407-B Settling Pond sludges	EP toxic	Listed waste F006 Cd > 1.0 mg/L Cr > 5.0 mg/L Pb > 5.0 mg/L
KOH scrubber sludges	Corrosive	pH>12.5 (D002)

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Table 4. Information Requirements Checklist - Ground Water Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(c)(1)	Interim status ground-water monitoring results	E-1
270.14(c)(2)	Identification of uppermost aquifer, including flow rate and direction	E-2
270.14(c)(3) and 270.14(b)(19)	Topographic maps related to ground water protection (well location, water table elevation contours, etc.)	EIR
270.14(c)(4) (i) and (iii)	Description of existing contamination	EIR
270.14(c)(5)	Detailed plans for ground water monitoring program	E-4
270.14(c)(6)	Description of detection monitoring program (if applicable)	N/A
270.14(c)(7) and (c)(7)(ii)	Description of compliance monitoring program and characterization of contaminated ground water (if applicable)	E-4, E-5
270.14(c)(7)(iv)	ACL demonstration (if any)	N/A
270.14(c)(8)	Corrective action program (if applicable)	N/A
270.17(b)(1) and 270.21(b)(1)	Description of liner and leachate collection systems (if applicable)	N/A

Table 4. (Continued)

Regulation	Description	Location in RCRA Permit Application
<u>Additional Information</u>		
	Existing map showing location of all known wells within three miles; number and location of drinking water wells	EIR
	Discussion of ground water uses within three miles of unit	EIR
	Regional map showing areas of ground water recharge and discharge	EIR
	Net precipitation using net seasonal rainfall or other available data	EIR
	Unless otherwise reported to EPA, available well data indicating a release, and information on any affected public or private water supplies, including populations served	EIR
	Any known foot chain contamination due to prior release from the unit to ground water	EIR

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Table 5. Information Requirements Checklist - Surface Water Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(11) (iii) thru (v)	Location information related to 100 yr flood plain including variance demonstrations	N/A (see EIR)
270.21(b)(2)	System for control of run-on from each peak discharge of 25 yr storm	N/A
270.21(b)(3)	System for control of run-off from 24 hr, 25 yr storm	N/A
270.17(b)(2)	Procedures/equipment to prevent overtopping	D-4e
270.17(b)(3)	Structural integrity of dikes	D-4f
<u>Additional Information</u>		
	Discussion of surface-water uses within three miles of the unit, including a map showing the location of all surface water bodies and downstream drinking water intakes	EIR
	Velocities of streams and rivers passing through and adjacent to the property	EIR
	Description of any system used to monitor surface water quality, and a summary of the data	EIR
	Description of known releases to surface water; the extent of contamination; remedial action, if any; and if known, severity of impact.	EIR
	Any known food-chain contamination resulting from the unit to surface water	EIR

Table 6. Information Requirements Checklist - Air Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
270.14(b)(9) 270.21(f) and (g), 270.21(h) and (i)	Documentation of procedures to prevent accidental ignition or reaction	N/A
270.21(b)(5)	Plans to control wind dispersal of particulate matter at landfills	N/A
270.14(b)(19)(v)	A wind rose showing prevailing windspeed and direction	Fig. B-1
<u>Additional Information</u>		
	Summary of air monitoring data and a description of current monitoring system, if any	EIR
	Population within a four mile radius of the unit	EIR
	Describe any known releases to air; the extent of contamination; remedial action, if any; and severity of impact, if known	EIR

Table 7. Information Requirements Checklist - Contaminated Soil Pathway

Regulation	Description	Location in RCRA Permit Application
<u>Information in Part B Application</u>		
None in addition to General Information Requirements		
<u>Additional Information</u>		
	If soil sampling has been done, a map showing areas of soil contamination, and a summary of analytical results	N/A
	Description of the types of major releases that resulted in soil contamination, and any clean-up action	EIR
	Any known food-chain contamination resulting from the use of contaminated soils for raising crops	N/A

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Table 8. Information Requirements Checklist - Transportation Information

Regulation	Description	Location i RCRA Permi- Applicatio
<u>Information in Part B Application</u>		
270.14(b)(10)	Traffic pattern, volume, and controls; access road characteristics	B-4
<u>Additional Information</u>		
	Description of the types and capacities of vehicles used to transport waste	EIR
	Identification of normal transport routes for hazardous waste into the site and within one mile of the facility entries	N/A
	Description of procedures for clean-up of transportation-related spills or leaks	EIR
	Descriptions of any transportation accidents releaseing hazardous wastes on-site, or in the immediate vicinity	EIR

Table 9. Information Requirements Checklist - Management Practices Information

Regulation	Description	Location i RCRA Permi Application
<u>Information in Part B Application</u>		
270.14(b)(12) 264.16	Outline of programs to train employees to safely operate and maintain facility, including emergency response activities	H
<u>Additional Information</u>		
	Summary of existing records on worker illness or injury, related to the operation of the unit; include summaries of Workman's Compensation claims, or hospital records	EIR

D366 L-T-13